ABSTRACT

A method of transmitting a data bit stream on a multi-carrier transmission system is provided. The steps include estimating a signal to noise ratio for each carrier for a known transmit power for each carrier, allocating a quantity of bits for each carrier within limits imposed by a target bit error rate and the estimated signal to noise ratio, computing a total excess power available for a current allocation of bits, computing additional power that would be required by each carrier to carry additional bits, and allocating the total excess power based on the computation of additional power required by each carrier to carry additional bits. The computation of additional power needed may be performed by computing the additional gain necessary to carry additional bits or by computing the additional excess power necessary to carry additional bits. Additional steps for transmitting the data stream include converting the data bit stream into a plurality of parallel bit streams based on the allocation of the total excess power, encoding the parallel bit streams, scaling the encoded parallel bit streams based on the allocation of the total excess power; and modulating the encoded and scaled parallel bit streams for transmission. In allocating excess power, priority may be given to the carriers requiring the least additional gain or excess power by, for example, sorting the carriers from least to greatest computed gain or excess power required to carry additional bits. The steps of computing total excess power; computing gains and excess power required by each carrier to carry additional bits, and allocating the total excess power may be repeated as necessary until target bit rate and/or computational constraints are met. The invention also provided an implementation involving fractional allocation and methods to communicate fractional bit allocation. Fractional bit

allocation may cause an increase in Peak to average ratio (PAR) of the signal, methods to mitigate increase in PAR are also provided.